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How We Manage the Multiple Ligament Injured (Dislocated) Knee

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Multiple-ligament knee injuries are increasingly recognized and require a multidisciplinary approach to treatment. Emergency department evaluation should focus on life- and limb-threatening issues with a high degree of suspicion for associated neurovascular injuries. The initial management should focus on emergent reduction with treatment priority given to vascular injuries. The management of ligamentous injuries should be undertaken after the treatment of vascular and bony injuries. After appropriate physical examination and imaging studies, an experienced surgeon will direct the surgical repair or reconstruction of the damaged ligaments. Our philosophy for surgical treatment of the knee with multiple-ligament injuries emphasizes the anatomic repair or reconstruction of each torn ligament and that ligament healing and stability take priority over knee range of motion. Indeed, in these complex injuries, stiffness is easier to address than recurrent instability.

Oper Tech Sports Med 18:211-218 © 2010 Published by Elsevier Inc.

KEYWORDS knee dislocation, multi-ligament knee injury

Multiple-ligament knee injuries typically occur during acute knee dislocations and represent <0.02% of all orthopedic injuries.^{1,2} The reported incidence of knee dislocations is rising, however, as participation in high-level contact sports increases and clinicians become more adept at recognizing spontaneously reduced dislocations.

Traditionally, the classification of knee dislocations was based on the position of the tibia with respect to the femur.³ Anterior dislocations are the most common (40%) and are caused by a hyperextension mechanism. Posterior dislocations (33%) occur when a high-energy, posteriorly directed force is applied to a flexed knee, such as with dashboard injuries.⁴ Lateral and medial dislocations are less common, accounting for 18% and 4% of acute knee dislocations, respectively.⁴ Lateral dislocations typically result from a valgus load, and medial dislocations result from a varus load. Rotatory dislocations are rare. These twisting injuries result in a posterolateral dislocation of the tibia and can be irreducible if the medial femoral condyle buttonholes through the medial soft-tissue structures.⁵ Knee dislocations can also be classified based on energy (high vs low velocity)⁶ or acuity (acute vs chronic).²

A classification based on anatomy was proposed recently by Wascher.⁷ Knee dislocation type I (KD-I) is a cruciate-intact dislocation (a rare injury). In KDII injuries, both cruciates are torn, but the collaterals are intact. Disruption of one of the collaterals upgrades the injury to a KD-III or KD-III with disruption of the Medial Collateral Ligament (MCL) or lateral collateral ligament (LCL), respectively. In a KD-IV, the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), MCL, and LCL are all torn. Finally, the presence of a periarticular fracture makes an injury a KD-V. We find this classification to be useful in planning treatment; the majority of injuries are KD-III or KD-III. Isolated bicruciate injuries (KDII) represent a less commonly encountered third group.

Initial Management

The initial assessment of a patient with a knee dislocation should begin with the ABC's of trauma care. Once the primary and secondary surveys have been completed and the patient is stabilized, the orthopedic surgeon should focus attention on the injured extremity.

It is of paramount importance to approach these patients systematically, with vascular injuries receiving top priority followed by osseous and then ligamentous injuries. The following steps are recommended for evaluating all knee dislocations: (1) a brief history focusing on energy and mechanism

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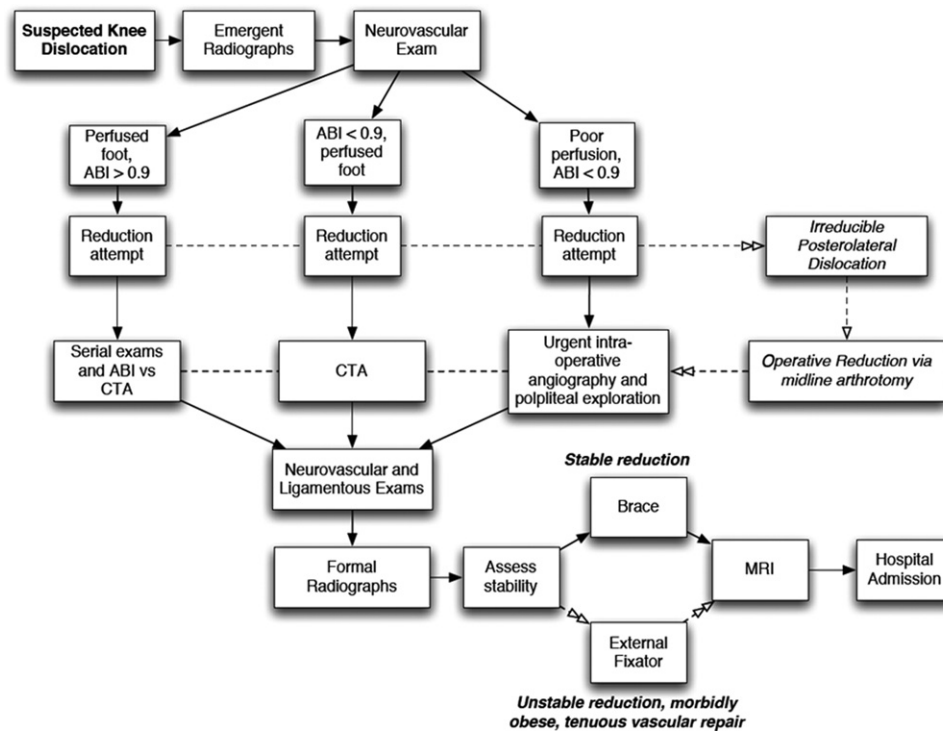


Figure 1 The initial approach to the multiple-ligament injured knee.

of injury, (2) a brief neurovascular examination, (3) an urgent attempt at reduction if the knee is still dislocated, (4) radiographic confirmation of reduction, (5) a second neurovascular examination including an ankle/brachial index (ABI), (6) ligamentous examination with analgesia or sedation, (7) knee immobilization, and (8) definitive radiographic studies (Fig. 1).

History and Physical Examination

Start by taking a succinct history. The main goal is to establish the mechanism of injury and determine if other injuries are present. High-velocity injuries occur in motor vehicle accidents, low-velocity injuries occur in sports, and ultra-low-velocity injuries occur with minor trauma, such as a fall from standing in the morbidly obese. Increasing velocity and morbid obesity portend a higher risk of neurovascular injury.⁶ The history should be followed by a rapid neurovascular examination, including pulses, skin temperature and color, and basic sensorimotor evaluation of the leg distal to the injury. All findings should be compared with the contralateral extremity.

Emergent radiographs are obtained to confirm the direction of dislocation and assess for fractures followed by closed reduction with longitudinal traction and reversal of the deforming force. The presence of a medial dimple is an important sign of an irreducible posterolateral dislocation; the medial femoral condyle buttonholes through the anteromedial capsule, dragging the medial skin and subcutaneous tissues into the joint.⁶ In this case, we advocate going to the operating room immediately and performing the reduction through a small midline arthrotomy that will not compromise future incisions required for reconstruction. The primary repair of

disrupted medial structures can be performed at the same time. Similarly, we treat open dislocations with urgent irrigation of the knee and primary closure followed by 48 hours of intravenous antibiotics. The patient is then treated according to the same algorithm as closed injuries.

After reduction, the neurovascular examination should be repeated and thoroughly documented because neurovascular injury has been reported in 15% to 60% of knee dislocations.^{2,8} Palpate the dorsalis pedis and posterior tibial pulses and assess the skin's color, temperature, and capillary refill for an indication of the quality of arterial perfusion. Patients with a nonperfused limb should be taken immediately to the operating room to expedite the repair of vascular injuries. The amputation rate has been reported to be as high as 86% if the vascular repair is delayed for >8 hours.⁴

Assesment of Vascular Status

In patients with adequate perfusion, pulses should be compared with the contralateral limb to establish a baseline. It should be stressed that although an abnormal pulse suggests vascular injury and mandates immediate intervention, a normal pulse does not rule out vascular injury because the sensitivity of a pulse examination in detecting vascular injuries is <80%.⁹ We recommend including an ABI in the physical examination. Several recent studies have shown 100% sensitivity when a physical examination includes an ABI.^{10,11} We advocate observation and serial ABIs for a patient with a normal physical examination and an initial ABI greater than 0.9 for 48 hours.¹² Of particular concern are intimal flap injuries to the popliteal artery that may present with a normal examination initially but are at risk for delayed thrombosis.¹³

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